

**THIRUVALLUVAR UNIVERSITY**  
**BACHELOR OF SCIENCE**  
**B.Sc. MATHEMATICS DEGREE COURSE**

(With effect from 2020 - 2021)

**The Course of Study and the Scheme of Examinations**

S. No.	Part	Study Components		Ins. Hrs / week	Credit	Title of the Paper	Maximum Marks		
		Course Title					CIA	Uni. Exam	Total
<b>SEMESTER I</b>									
1.	I	Language	Paper-1	6	4	Tamil/Other Languages	25	75	100
2.	II	English (CE)	Paper-1	6	4	<b>Communicative English I</b>	25	75	100
3.	III	Core Theory	Paper-1	5	3	Algebra	25	75	100
4.	III	Core Theory	Paper-2	5	3	Trigonometry	25	75	100
5.	III	Allied -1	Paper-1	4	3	<b>(to choose any 1 out of 4)</b> (For Practical Allied subjects)	25	75	100
	III	Allied- 1	Practical-1	2	0		0	0	0
<b>6.</b>	<b>III</b>	<b>PE</b>	<b>Paper 1</b>	<b>6</b>	<b>3</b>	<b>Professional English I</b>	<b>25</b>	<b>75</b>	<b>100</b>
7.	IV	Environmental Studies		2	2	Environmental studies	25	75	100
		<b>Sem. Total</b>		<b>36</b>	<b>22</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER II</b>									
8.	I	Language	Paper-2	6	4	Tamil/Other Languages	25	75	100
9.	II	English (CE)	Paper-2	6	4	<b>Communicative English II</b>	25	75	100
10.	III	Core Theory	Paper-3	4	3	Calculus	25	75	100
11.	III	Core Theory	Paper-4	4	3	Analytical Geometry of three dimensions	25	75	100
12.	III	Allied-1	Paper-2	4	3	<b>(to choose any 1 out of 4)</b> (For Practical Allied subjects)	25	75	100
13.	III	Allied Practical - 1	Practical-1	2	2	<b>(to choose any 1 out of 4)</b> (For Practical Allied subjects)	25	75	100
<b>14.</b>	<b>III</b>	<b>PE</b>	<b>Paper 1</b>	<b>6</b>	<b>3</b>	<b>Professional English II</b>	25	75	100
15.	IV	Value Education		2	2		25	75	100
16.	IV	Soft Skill		2	1		25	75	100
		<b>Sem. Total</b>		<b>36</b>	<b>25</b>		<b>225</b>	<b>675</b>	<b>900</b>
<b>SEMESTER III</b>									
17.	I	Language	Paper-3	6	4	Tamil / Other Languages	25	75	100
18.	II	English	Paper-3	6	4	English	25	75	100
19.	III	Core Theory	Paper-5	6	5	Differential Equations	25	75	100
20.	III	Allied-2	Paper-3	4	3	<b>(to choose any 1 out of 4)</b> (For Practical Allied subjects)	25	75	100
	III	Allied Practical - 2	Practical-2	3	0		0	0	0
21.	IV	Skill Based Subject	Paper-1	3	2	Mathematics for competitive Examinations - I	25	75	100
22.	IV	Non-Major Elective	Paper-1	2	2	Basic Mathematics	25	75	100
		<b>Sem. Total</b>		<b>30</b>	<b>20</b>		<b>150</b>	<b>450</b>	<b>600</b>
23.	I	Language	Paper-4	6	4	Tamil/Other Languages	25	75	100

24.	II	English	Paper-4	4	4	English	25	75	100
25.	III	Core Theory	Paper-6	5	4	Vector Analysis and Fourier Series	25	75	100
26.	III	Core Theory	Paper-7	4	4	Mechanics	25	75	100
27.	III	Allied-2	Paper-4	4	3	<b>(to choose any 1 out of 4)</b> (For Practical Allied subjects)	25	75	100
28.	III	Allied Practical - 2	Practical-2	3	2		25	75	100
29.	IV	Skill Based Subject	Paper-2	2	2	Mathematics for Competitive Examinations - II	25	75	100
30.	IV	Non-Major Elective	Paper-2	2	2	Foundation Mathematics for Competitive Examinations - I	25	75	100
		<b>Sem. Total</b>		<b>30</b>	<b>25</b>		<b>200</b>	<b>600</b>	<b>800</b>
<b>SEMESTER V</b>									
31.	III	Core Theory	Paper-8	6	4	Abstract Algebra	25	75	100
32.	III	Core Theory	Paper-9	6	4	Real Analysis - I	25	75	100
33.	III	Core Theory	Paper-10	6	4	Complex Analysis - I	25	75	100
34.	III	Core Theory	Paper-11	3	3	Programming in C Language	25	75	100
35.	III	Core Practical	Practical-1	3	2	C Language	25	75	100
36.	IV	Elective	Paper-1	3	3	<b>(to choose any 1 out of 2)</b> 1. Linear Programming 2. Special Functions	25	75	100
37.	IV	Skill Based Subject	Paper-3	3	2	Mathematics for Competitive Examinations - III	25	75	100
		<b>Sem. Total</b>		<b>30</b>	<b>22</b>		<b>175</b>	<b>525</b>	<b>700</b>
<b>SEMESTER VI</b>									
38.		Core Theory	Paper-12	5	4	Linear Algebra	25	75	100
39.		Core Theory	Paper-13	6	4	Real Analysis II	25	75	100
40.		Core Theory	Paper-14	5	4	Complex Analysis - II	25	75	100
41.		Compulsory Project	Paper-15	5	5	Group / Individual Project	25	75	100
42.		Elective	Paper-2	3	3	<b>(to choose any 1 out of 2)</b> 1. Graph Theory 2. Discrete Mathematics	25	75	100
43.		Elective	Paper-3/ Elective Practical-1	3	3	<b>(to choose any 1 out of 2)</b> 1. Fuzzy Mathematics.(Theory) 2. R Programming (Practical Only)	25	75	100
44.		Skill based Subject	Paper-4	3	2	Operations Research	25	75	100
45.		Extension Activities		0	1		100	0	100
		<b>Sem. Total</b>		<b>30</b>	<b>26</b>		<b>275</b>	<b>525</b>	<b>800</b>
		<b>Grand Total</b>			<b>140</b>				<b>4500</b>

<b>Part</b>	<b>Subject</b>	<b>Papers</b>	<b>Credit</b>	<b>Total Credits</b>	<b>Marks</b>	<b>Total Marks</b>
Part I	Languages	2	4	8	100	200
Part II	Communicative English & English	2	4	8	100	200
Part III	Allied (Odd Semester)	2	3	6	100	200
	Allied (Even Semester)	2	5	10	100	200
	Allied Practical	2	2		100	200
	Electives	3	3	9	100	300
	Core	14	(3-5)	52	100	1400
	Core practical	1	2	2	100	100
	Professional English	2	3	6	100	200
	Compulsory Project (Group/Individual Project)	1	5	5	100	100
Part IV	Environmental Science	1	2	2	100	100
	Soft skill	1	1	1	100	100
	Value Education	1	2	2	100	100
	Lang. & Others /NME	2	2	4	100	200
	Skill Based	4	2	8	100	400
Part V	Extension Activities	1	1	1	100	100
	<b>Total</b>	<b>43</b>		<b>140</b>		<b>4500</b>

# THIRUVALLUVAR UNIVERSITY

## B.Sc. MATHEMATICS

### SYLLABUS

### CBCS PATTERN

(For the candidates admitted from 2020 - 2021)

### SEMESTER III

### PAPER - 5

### DIFFERENTIAL EQUATIONS

#### Objectives

This course aims to provide logical skills in the formation of differential equations, to expose to different techniques of finding solutions to these equations and in addition stress is laid on the application of these equations in geometrical and physical problems.

#### UNIT - I

##### ORDINARY LINEAR DIFFERENTIAL EQUATIONS

Bernoulli Equation - Exact Differential Equations - Equations Reducible to Exact Equations - Equations of First order and Higher degree: Equations solvable for  $p$ , Equation solvable for  $x$  and Equations Solvable for  $y$  - Clairaut's Equation.

#### UNIT - II

##### ORDINARY LINEAR DIFFERENTIAL EQUATIONS [CONTD...]

Method of Variation of Parameters - 2<sup>nd</sup> order Differential Equations with Constant Coefficients for finding the P.I's of the form  $e^{ax} V$ , where  $V$  is  $\sin(mx)$  or  $\cos(mx)$  or  $x^n$  - Equations reducible to Linear equations with constant coefficients - Cauchy's homogeneous Linear Equations - Legendre's Linear Equations.

#### UNIT - III

##### DIFFERENTIAL EQUATIONS OF OTHER TYPES

Simultaneous Equations with Constant coefficients - Total Differential Equations  
Simultaneous Total Differential Equations - Equations of the form  $dx/P = dy/Q = dz/R$

#### UNIT - IV

##### LAPLACE TRANSFORM

Transform-Inverse Transform - Properties - Application of Laplace Transform to solution of first and second order Linear Differential equations [with constant coefficients].

## UNIT - V

### PARTIAL DIFFERENTIAL EQUATIONS

Formation of PDF - Complete Integral - Particular Integral - Singular Integral - Equations Solvable by direct Integration - Linear Equations of the first order - Non-linear Equations of the first Order:

**Types:**  $f(p, q) = 0$ ,  $f(x, p, q) = 0$ ,  $f(y, p, q) = 0$ ,  $f(z, p, q) = 0$ ,  $f(x, q) = f(y, p)$ ,  
 $z = px + qy + f(p, q)$ .

#### Recommended Text

S.Narayanan and T.K.Manicavachagom Pillay[2004] , Calculus, S.Viswanathan Printers and publishers Private Ltd., Chennai.

#### Reference Books

1. M.D. Raisinghania, [2001] Ordinary and Partial Differential Equations, S.Chand and Co., New Delhi.
2. M.R.Spiegel [2005] Advanced mathematics for Engineers and Scientists, Tata McGraw Hill Edition, New Delhi.
3. M.R.Spiegel [2005] Laplace Transforms, Tata McGraw Hill Edition, New Delhi.
4. S.Sudha [2003] Differential Equations and Integral Transforms, Emerald Publishers, Chennai.
5. M.K.Venkataraman [1998] Higher Engineering Mathematics, III-B, National Publishing Co., Chennai.
6. P.R.Vittal [2004] Differential Equations and Laplace Transform, Margham Publications, Chennai.
7. P.Kandasamy, K.Thilagarathy [2004] Mathematics for B.Sc. Vol. III S.Chand& Co., Ltd., New Delhi-55.
8. B.S.Grewal [2002] Higher Engineering Mathematics, Khanna Publishers, New Delhi.
9. Sheply. L.Ross [1984] Differential Equations, III Edition John Wiley and Sons, New York.

#### Course Outcomes

At the end of the course the student will be able to

- [1] solve the first order higher degree differential equations
- [2] solve the second order differential equations
- [3] know the concept of total differential equations
- [4] know the applications of Laplace transform
- [5] solve the partial differential equations.

## **SKILL BASED SUBJECT**

### **PAPER - 1**

#### **MATHEMATICS FOR COMPETITIVE EXAMINATIONS - I**

##### **Objectives**

To introduce concepts of mathematics with emphasis on analytical ability and computational skill needed in competitive examinations.

##### **UNIT - I**

Numbers, H.C.F. and L.C.M. of numbers, Decimal Fractions.

##### **UNIT - II**

Simplification, Square roots and Cube Roots, Average.

##### **UNIT - III**

Problems on numbers, problems on Ages.

##### **UNIT - IV**

Surds and Indices, Percentage, Profit and Loss.

##### **UNIT -V**

Ratio and Proportion, Partnership.

##### **Text Books:-**

1. R.S.Aggarwal, Quantitative Aptitude for competitive Examination, S.Chand and company, New Delhi.
2. Praveen R. V. Quantitative Aptitude and Reasoning, PHI Learning Pvt. Ltd, New Delhi.

##### **Course Outcomes**

At the end of the course the student should be able to

- [1] know the idea H.C.F. and L.C.M.
- [2] find the Average, square root and cubic root
- [3] solve the problems on ages and numbers
- [4] know the percentage, profit and loss
- [5] analyze the proportion and partnership problems

## **NON-MAJOR ELECTIVE**

### **PAPER -1**

#### **BASIC MATHEMATICS**

##### **Objectives**

To introduce a few basic and elementary concepts of mathematics for other major students.

##### **UNIT - I**

###### **SETS**

Definition - Subsets - Power sets - Equality of sets - Finite and Infinite sets - Set operations - De-Morgan's laws - Distributive tables - Cartesian products.

##### **UNIT - II**

###### **NUMBER SYSTEM**

Binary, octal, hexadecimal numbers - conversion from one system to another system - addition and subtraction - one's complement.

##### **UNIT - III**

###### **SYMBOLIC LOGICS**

Logical statements - connectives - truth tables - tautologies operations - groups - (problems and simple properties only).

##### **UNIT - IV**

###### **DETERMINANTS**

Definition - properties (without proof) - application of determinants - Cramer's rule for the solution of a system of equations

##### **UNIT - V**

###### **MATRICES**

Definition - types of matrices - operations on matrices - adjoint and inverse - applications - solving non-homogeneous equations.

##### **Recommended Texts**

1. Dr.M.K.Venkataraman & others, "Discrete mathematics and structures", The National Publishing Company, Madras.
2. Trembly J.P and Manohar.R "Discrete Mathematical Structures with applications to computer science" Tata McGraw - Hill Pub., Co., Ltd. New Delhi 2003.

##### **Reference Books**

1. P.R.Vittal "Algebra, Analytical Geometry and trigonometry" Margham Publications, Chennai.
2. Richard Johnsonbaugh, "Discrete Mathematics" fifth Edn., Pearson Education Asia, New Delhi 2002.

## **SEMESTER - IV**

### **PAPER - 6**

## **VECTOR ANALYSIS AND FOURIER SERIES**

### **Course Objectives**

The aim of this course is to cover the topics in vector and tensor calculus which are essential in modern applied mathematics. To develop the deep knowledge of the vector differentiation, vector integration and Fourier series concepts and its applications in the branch of applied mathematics for engineers and scientists.

### **UNIT - I**

#### **DIFFERENTIAL VECTOR CALCULUS**

Differentiation of a Vector - Geometrical Interpretation of the Derivative - Differentiation Formulae - Velocity and Acceleration Vectors - Scalar and Vector Point functions - Level surface - Gradient - Equation of tangent plane - Unit normal to the given Surface - Differentiation of dot and Cross Products - Partial Derivatives of Vectors - Differentials of Vectors.

### **UNIT - II**

#### **GRADIENT, DIVERGENCE AND CURL**

Vector Differential Operator Del - Directional Derivative - Geometric Interpretation - Gradient of the sum of Functions; of the product of functions and of a function of function - Operations involving Del - Divergence of a Vector and its Physical Interpretation - Curl of a Vector and its Physical Interpretation - Expansion Formulae for Operators involving Del - Solenoidal and Irrotational - Simple Problems.

### **UNIT - III**

#### **VECTOR INTEGRATION**

The Line Integral - Surface Integral and its Physical Meaning - Volume integral - Simple Problems.

### **UNIT - IV**

#### **VECTOR INTEGRATION(CONTD.)**

Statements of Stoke's Theorem, Gauss Divergence Theorem and Green's Theorem - Simple Problems - Simple Problems Solved to Verify the Theorems.

### **UNIT - V**

#### **FOURIER SERIES**

Euler's Formulae - Conditions for Fourier Expansion - Functions having Discontinuity - Change of Interval - Odd and Even Functions - Expansions of Odd or Even periodic Functions - Half-range Series - Parseval's Formula.

### **Recommended Text**

Erwin Kreyszig (2011), *Advanced Engineering Mathematics*, John Wiley & Sons, Inc. (10<sup>th</sup> edition), Printed in the United States of America

### **Reference Books**

1. G.B.Thomas and R.L.Finney. (1998) *Calculus and Analytic Geometry*, Addison Wesley (9<sup>th</sup> edition), Mass. (Indian Print).
2. M.K.Venkataraman. (1992) *Engineering Mathematics-Part B*. National Publishing Company, Chennai.
3. P.R.Vittal. (2004) *Vector Calculus, Fourier series and Fourier Transform*. Margham Publications, Chennai.
4. B.S.Grewal (2012). *Higher Engineering Mathematics*, Khanna Publishers(42<sup>nd</sup> edition), Nai Sarak, New Delhi.

### **Course Outcomes**

At the end of the course the student should be able to

- [1] know the physical and geometrical meaning of the derivative
- [2] know the physical and geometrical meaning of the divergence and curl
- [3] evaluating line, surface and volume integrals
- [4] know the applications of Stoke's Theorem, Gauss Divergence Theorem and Green's theorem
- [5] analyze the Fourier series in both theory and application level

**PAPER - 7**  
**MECHANICS**

**OBJECTIVES**

This course aims to introduce the students the basic concepts of forces, moments, couple, friction and the centre of gravity..

**UNIT - I**

Forces, Type of forces- Resolution of forces - Resultant of two forces acting on a particle - triangle of forces, Lamis theorem - Resultant of several forces acting on a particle - Condition of equilibrium - Equilibrium of a particle under several forces - simple problems.

**UNIT - II**

Moment of a force - Parallel forces - Varignon's theorem - Forces along the sides of a triangle - Couples - Resultant of several coplanar forces - Equation of line of action of the resultant - Equilibrium of a rigid body under three coplanar forces - Reduction of coplanar forces into a force and a couple - simple problems.

**UNIT - III**

Center of mass - Center of mass of a triangular lamina - Three particles of same mass - Three particles of certain masses - uniform rods forming a triangle - lamina in the form of a trapezium and solid tetrahedron - Center of mass using integration - circular arc - circular lamina - elliptic lamina - solid and hollow hemisphere - solid and hollow right circular cone - simple problems.

**UNIT - IV**

Velocity, Relative Velocity, Angular Velocity, Acceleration, Rectilinear motion, Rectilinear motion with constant acceleration, Relative angular velocity. The Components of Velocity and Acceleration in

- a. Two Perpendicular directions
- b. Radial and Transverse directions
- c. Tangential and Normal directions.

**UNIT - V**

Motion of a projectile, Nature of a trajectory, Results pertaining to the motion of a projectile, Range on an inclined plane, Maximum range on the inclined plane - Impulsive force, Conservation of linear momentum, Impact of a sphere, Laws of impact, Impact of two smooth spheres, Direct impact of two smooth spheres - Oblique impact of two smooth spheres - Simple problems.

**Recommended Text**

P. Duraipandian, LaxmiDuraipandian ,MuthamizhJayapragasam, Mechanics, 6<sup>th</sup> edition, S. Chand and Company Ltd, 2005.

### **Reference Books**

1. M.K.Venkataraman, Statics, Agasthiyar Publications, 17th edition, 2014.
2. S. Narayanan, R. HanumanthaRao, K. Sitaraman, P. Kandaswamy, *Statics*, S. Chand and Company Ltd, New Delhi.
3. S. L. Loney, *An Elementary Treatise on Statics*, Combridge University Press, 1951
4. A.V. Dharmapadam(1991) *Mechanics*. S. Viswanathan Printers & Publishers. Chennai
5. Joseph F. Shelley (2005) *Vector Mechanics for Engineers Vol-I: Statics*, Tata McGraw Hill Edition, New Delhi.

### **Course Outcomes**

1. Provides basic knowledge of Resultant of forces and Equilibrium of a particle
2. Knowledge pertaining to Parallel forces and coplanar forces
3. To know about Center of mass
4. Gain the knowledge of projectile and its applications
5. Understand the concept of impact

**SKILL BASED SUBJECT**

**PAPER - 2**

**MATHEMATICS FOR COMPETITIVE EXAMINATIONS - II**

**UNIT - I**

Chain rule -Time and work.

**UNIT - II**

Time and Distance

**UNIT - III**

Problems on Trains.

**UNIT - IV**

Boats and Streams.

**UNIT - V**

Alligation or Mixture.

**Text Book:-**

Quantitative Aptitude for competitive Examination R.S. Aggarwal. S. Chand and company Ltd,152,Anna salai, Chennai. 2001

## **NON-MAJOR ELECTIVE**

### **PAPER - 2**

#### **FOUNDATION MATHEMATICS FOR COMPETITIVE EXAMINATIONS**

#### **Objectives**

To introduce concepts of mathematics with emphasis on analytical ability and computational skill needed in competitive examinations.

#### **UNIT - I**

Ratio and proportions

#### **UNIT - II**

Percentages

#### **UNIT - III**

Profit and loss, discounts.

#### **UNIT - IV**

Simple and compound interest.

#### **UNIT - V**

Time, Distance and Work

#### **Recommended Text books:**

1. R.S.Aggarwal, Quantitative Aptitude for competitive Examination, S.Chand and company, New Delhi.
2. Praveen R. V. Quantitative Aptitude and Reasoning, PHI Learning Pvt. Ltd, New Delhi.

#### **Course Outcomes**

At the end of the course the student should be able to

- [1] know the idea of ratio and proportions
- [2] find the percentages
- [3] profit and loss problems
- [4] know the simple and compound interest problems
- [5] analyze the time and distance problems